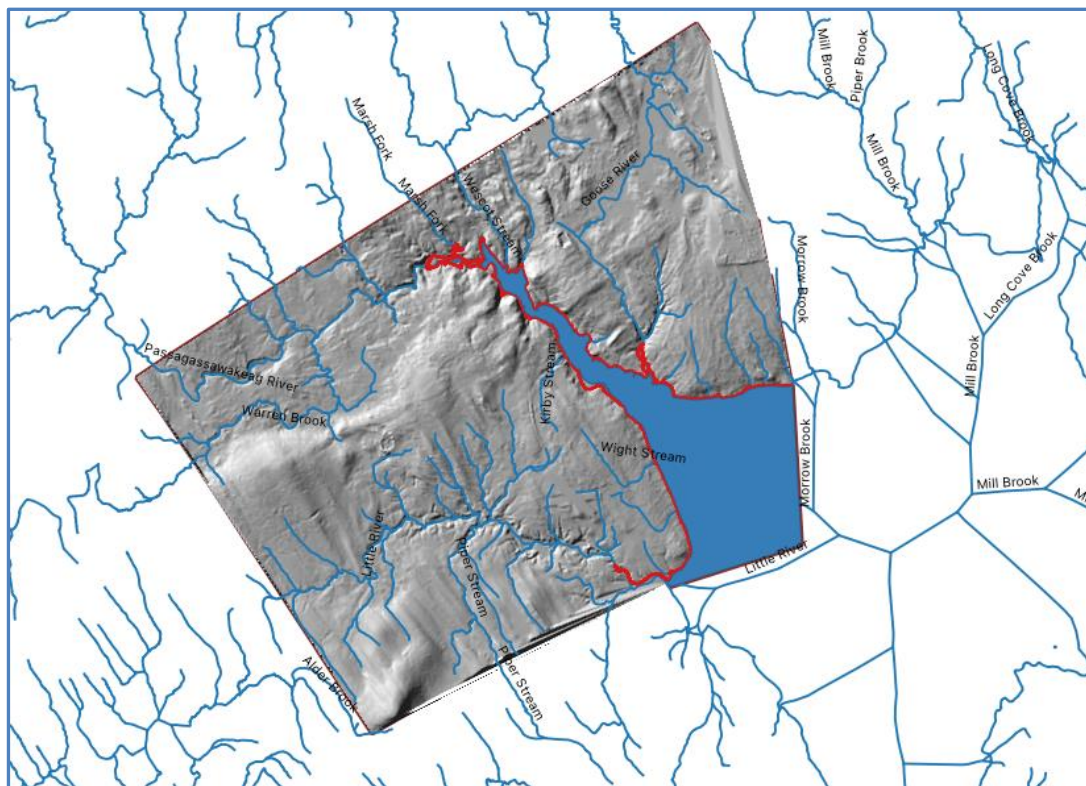


Climate Action Plan

City of Belfast

October 10, 2023 Revision



Revised and respectfully submitted by
the members of the Climate, Energy and Utilities Committee:
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Acknowledgments

The original version of this Climate Action Plan was written and submitted to the City of Belfast on June 4, 2023 by the members of the former Climate Crisis Committee: Bernard Baker, Jon Beal, Barbara Bell, Fred Bowers (Chair), Gerald Brand.

“All of Belfast: Climate Dialogues” (ABCD), a project of the Belfast Free Library under the leadership of Brenda Harrington, enhanced community participation in setting the goals of the Climate Action Plan. ABCD was funded by a grant from the Institute of Museum and Library Services. It has its own webpages within the Belfast Free Library’s website containing multi-media accounts of all the project’s activities, catalogued in various ways to make access user-friendly. This record shows all of ABCD’s work both with the former Climate Crisis Committee and independent of it. Anyone who wants to see more of the community “iceberg” beneath this Climate Action Plan can find it at ABCD. <https://belfastlibrary.org/all-of-belfast-climate-dialogues/>

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INTRODUCTION

Global Climate Change poses a supreme challenge to human civilization on Earth, together with all life. The changes are proceeding at a rate eclipsing natural adaptation and evolution. Since the end of the last ice age, about 10,000 years ago, Earth's climate has been in a relatively stable condition that allowed human civilization to flourish. Since the Industrial Revolution began around 200 years ago, humanity has pumped vast amounts of carbon dioxide and other "greenhouse gasses" into the atmosphere, resulting in global warming that threatens to change our environment, to the point where large portions of the planet may not be suitable for human habitation, and the rest will be very different from the environment in which our civilization developed. Now, humans must rely on their distinctively human ability to use our 'big brain' for adapting to, and possibly mitigating, the changes that are precipitated. Scientists are optimistic: our understanding and technology make us capable of mitigating, and even reversing, to a degree, the worst effects of climate change. If, collectively, humans have the will.

Belfast takes justifiable pride in a tradition of citizen involvement and activism to address community problems in the interest of making the City a better place for all. One way that involvement is expressed is through citizen advisory committees reporting to the City Council.

On March 20, 2018, the City of Belfast City Council voted unanimously to create the Belfast Climate Crisis Committee [CCC]. On January, 2019, the Mayor of the City of Belfast signed a commitment to the Global Covenant of Mayors. That document committed the City of Belfast to prepare for the impacts of climate change, to develop and formally adopt an assessment of climate hazards and vulnerabilities, and to develop a Climate Action Plan to address them.

This Belfast Climate Action Plan (CAP) is a product of the Climate Crisis Committee in furtherance of that initial commitment. It is intended as a **living document** to initiate further public input. It identifies actions to accommodate and mitigate the effects of climate change on the community. The emphasis is on actions that lead to a resilient community with equity in support for all citizens. In 2022, CCC issued a Greenhouse Gas Inventory, identifying the general sources of the GHGs emitted locally. This CAP summarizes our recommendations both for actions to pursue and policies to adopt.

POLICIES

To the knowledge of the Climate Crisis Committee, City of Belfast has not yet adopted a general policy for adapting to climate change, although it has proposed and/or implemented certain specific policies in that direction, such as analysis of stormwater systems and armoring the wastewater treatment system.

This CAP outlines, in each of its sections, specific **policies** that CCC recommend be adopted, in order to achieve resilience and preparedness for the changes to come. In deciding how to implement these policies, the City must first decide its "risk horizon": i.e. how far into the future it wishes to plan, and what amount of change it wants to plan for. For example, in deciding how to address sea level rise, the City might adopt recommendations made in *Maine Won't Wait*, the 2020 Report in which the Maine Climate Council recommended **committing to manage** for 1.5 feet of relative sea-level rise by 2050, relative to the year 2000, and 3.9 feet of sea-level rise by the year 2100. Additionally, the Maine Climate Council recommended **preparing to manage** for 3.0 feet of relative sea-level rise by 2050, and 8.8 feet of sea-level rise by the year 2100. Or take another example: in deciding how to address policies concerning Emergency Facilities or Public Health, the City might choose to manage for conditions anticipated in 10

years or 20 years, in light of factors such as the age of our population, and the current availability of state and federal funds [See also section on “Sample Funding Sources”].

GOALS

In addition to the specific policies in each section, CCC recommends the adoption of the following overall goals:

1. Belfast will achieve carbon-neutrality by 2030, and a carbon-zero status¹ by 2045, in accordance with “Maine Won’t Wait” State targets.
2. During this period, Belfast will make changes in its physical infrastructure and its governance to meet the challenges of the climate crisis while reducing the costs of inaction.
3. Belfast will make these changes in ways that will increase economic activity and jobs.
4. Belfast will make these changes while maintaining its sense of community and supporting all of its citizens.

IMPLEMENTATION

CCC recognizes that we are recommending broad and substantial changes in the City’s policies and practices: this is because the challenges the residents face are broad and substantial. These changes will cost money, and the City will need to devote staff time. In this CAP, CCC has “coded” one possible method of implementing,² but it is extended and fragmented. In order to use City money and time wisely, we recommend that the City invest in a staff member, contractor or contracted entity to act as Sustainability Coordinator, at least part-time. That person would coordinate policy changes among departments, write and administer grants, keep current with state, federal and scientific developments, and generally implement this CAP.

Such a person will have a cost. Given Maine’s sustained commitment to and funding for climate action throughout the state, not to mention historic federal commitments not abrogated, it is hard to believe that a Sustainability Coordinator could not generate grants sufficient to cover the position’s cost—and more.

In deciding how to respond to the challenges of climate change, Belfast will have to carefully weigh many issues, and apply the most current scientific recommendations. It will also have to decide on long-term policies, making a decision in each case as to the risk horizon, and take steps towards resiliency in advance of acute crisis events. CCC is confident Belfast can do this.

¹ Carbon zero means GHG emissions are not being produced. Carbon neutral means some GHG emissions are generated but offset somewhere else to make overall GHG emissions zero.

² In the CAP below, see blue labels after each action item indicating party responsible for implementing, as follows: **[City]**; **[CCCS]**=Climate Crisis Committee Successor - Climate, Energy, and Utilities Committee [CEUC]; **[CCCS+]**=CEUC augmented by any person, City committee, outside group or other entity, etc. that CEUC needs to collaborate with for the particular action; **[Community]**= any group or set of groups representing the Belfast community; **[Ind]**=individual community member/s.

CRITICAL INFRASTRUCTURE

Critical Infrastructure is defined as those common systems and resources that are vital to daily operations in the City and community, ranging from water pipes to radio towers. Climate change is creating a heightened need to protect the five types of critical infrastructure that are particularly vulnerable here in Belfast, namely, sewers and wastewater treatment; stormwater drainage; roads; marine facilities; and emergency services or facilities. In a survey of public opinion taken by “All of Belfast: Climate Dialogues” (ABCD) that asked “What do you think are the most urgent issues to address in the Belfast Climate Action Plan?” three had the same number of votes at the top, and Critical Infrastructure was one. At present, the City does not have as much data as it needs to assess the vulnerabilities of each Critical Infrastructure system, much less to plan protections for all. Nonetheless, it has made a start.

Recommended City Policy: Assess vulnerabilities throughout Belfast’s existing critical infrastructure systems and plan to upgrade, protect, or otherwise manage them for greater resilience, given the predicted impacts of climate change now and into the future, per the risk horizon decided.



Sewage and Wastewater Treatment System



Figure 1 Aerial Photo Map of Front Street showing the 14 foot elevation contour line if sea level rises as predicted by 2050.

The Wastewater Treatment Plant (WWTP), located at 10-15 feet above present mean high tide, has been assessed by the City Engineers as vulnerable to flooding from sea-level rise and storm surge anticipated in the near future. The assessment and a plan to deal with it are contained in Olver’s detailed report, the “2022 Climate Adaptation Plan”, approved by the Council last year.

Recommended City Policy: Consider the WWTP Belfast’s highest priority in terms of protection against flooding, and investigate possible alternate siting.

IMMEDIATE PRIORITY action:

- Harden the WWTP site to prevent flooding, per the “2022 Climate Adaptation Plan.” [City]

LONG-TERM actions:

- Per the “2022 Climate Adaptation Plan”, review the sea-level rise at the harbor every five years, and upgrade hardening for WWTP site as needed. [City]
- Per the “2022 Climate Adaptation Plan”, investigate and assess the possibility of building a new WWTP at a site not vulnerable to flooding. [City]
- As the state certifies the necessary new wastewater treatment technology, adopt it to minimize sludge and reduce or eliminate PFAS. [City]
- As the state certifies new technology that treats water to a standard permitting its return to the aquifer instead of discharge into Belfast Bay, adopt it. [City]

Stormwater System

The stormwater drainage system in Belfast is old-to-very-old, and needs to be upgraded system-wide. Frequent incidents of overflow, seepage, wet basements, street flooding, and soil erosion are caused by failures of the old system. Moreover, climate change has already led to extreme storms, increasing the impacts of erosion throughout Belfast. Finally, the terrain along the shores of the Passy River in Belfast, particularly on the west side, is especially vulnerable to erosion, not only because of its steep slope and the extent of impermeable surfaces downtown, but because the soils in this part of the City are poorly drained, meaning they allow more runoff from storms than well-drained soils do. In sum: the downtown harbor area suffers triple jeopardy from erosion.

During September 2022, the City Council took a first step toward upgrading Belfast’s stormwater drainage system by approving a survey and digital mapping of the entire system proposed by the City Engineers in a plan entitled “Stormwater Drainage System Review scope of work project.”

Recommended City Policy: Undertake assessment and necessary upgrades to Belfast’s stormwater drainage system for resilience, per the risk horizon decided. A policy of resilience should favor not simply stormwater disposal, but stormwater conservation and storage as freshwater for beneficial use.

IMMEDIATE PRIORITY actions:

- Complete the combined stormwater and sewage routing (CSO) elimination program in accordance with City Engineers’ advice. [City]
- Following the current survey and mapping phase, determine the need to increase the capacity of the existing and future system—drainpipes and culverts—to accommodate projected increased peak storm rainfall intensity and duration. [City]

LONG-TERM actions:

- Design and contract increased capacity for stormwater system per above. [City]
- Require developers and engineers who size retention ponds for new construction to store water as much as possible. Overflow water can be captured and retained downstream as reserves of freshwater to be used for drought reduction and habitat. [City]
- Review the design and capacity of City-owned drainage ditches and culverts that redirect rainwater runoff in areas outside of the stormwater drainage system, and make any appropriate upgrades. Belfast has long regarded open ditches as desirable in some locations. Ditches can act as storage basins if they have an outlet to a culvert. The City has maintained its ditches very well by cleaning them regularly. [City]
- Encourage residents to plant trees, shrubs, and ‘rain gardens’ on both public and private land, using species that can absorb excess rain. [CCCS+][Community][Ind]
- Recommend and publicize a best practice to infiltrate stormwater from houses. [CCCS+]

Roads



Roads are critical for commerce, public safety, and general mobility in Belfast, since mass transit is limited. The costs to repair roads are high.

The Public Works Department has a standard procedure to replace failing culverts and shoulders when they are damaged by storms and when streets are paved. The Department also acts quickly to sweep up gravel and leaves when they endanger the proper functioning of culverts, streets, and ditches. Given weather patterns driven by climate change beyond normal bounds, however, the City needs to move toward greater resilience.

Recommended City Policy: Evaluate the vulnerability of the City road system to flooding and plan for resilience in advance. In collaboration with other municipalities, develop a strategy to work more closely with MEDOT officials on joint maintenance programs for critical State-controlled roads and ROWs through municipalities and joint advance planning for such roads.

IMMEDIATE PRIORITY actions:

- Digitally map those areas where low elevation and ponding make flooding along certain roads likely. GIS 2-foot Lidar coverages are available from the State of Maine GIS database that help with advance planning to protect roads against weather-related damage, to repair roads that have already sustained damage, and at a minimum, to alert the Public Works Department or the police where to post warning signs for the driving public. [City]

LONG-TERM actions:

- Continue following Department of Public Works policy and practice to elevate, regrade, and upgrade vulnerable roads to appropriate standards where necessary, and improve drains and culverts that are undersized or broken. [City]
- Consider repurposing roads that are proving most vulnerable to sea-level rise. [City]
- Actively engage with MEDOT to conduct regular maintenance of drains, culverts, ditches, and trash grates along State ROWs in Belfast. [City]
- Negotiate with MEDOT to plan jointly for the future of State roadways passing through Belfast. [City]

Marine Facilities and Access

Belfast Harbor hosts two major private marinas and a Public Landing with a launching ramp, support facilities, an array of docks, and rental moorings. Private moorings and floating docks are available from the private marinas. Larger mooring fields in the inner and outer harbor are managed by the Harbormaster. Recreational marine activities are thriving; shipbuilding and commercial boat services/repair are steadily increasing. Commercial fishing has an historical presence, and investment in sea-based marine aquaculture has grown. Over 240 private properties abut the shore of Belfast Bay within the City limits. Per Maine State statutes, however, Belfast ensures access to the shore, as the harbor is a public asset.

The bathymetry, open exposure, and orientation of Belfast Harbor to the southeast leaves it vulnerable to storms, whose energy typically results in short-period 3-4 second waves. The longest fetch is from the south. Sea-level rise threatens flooding particularly to the lower elevations of the harbor's west side, which are only a few feet above the historic maximum high tide of 13+ feet. High-tide flooding that's now only a nuisance will be the daily normal by 2100.

The breakwater protecting City Landing has deteriorated during large storms and is past its useful life. After a 2019 substitute proposal for protecting the harbor was deemed infeasible, a new study was begun to address the failing breakwater. Completed in February 2023, it offered preliminary designs for three options, and some cost figures. Further study seems needed. The improvement process will be handled by the Belfast Harbor Department.

Recommended City Policy: Replace the breakwater to protect City Landing; next, if retreat is not acceptable in the mid to long term, a comprehensive plan to protect all of Belfast Harbor from sea-level rise, storm-driven waves and surge is essential. Priority should be given to the west side, where substantial public and private investment in infrastructure is most at risk.

IMMEDIATE PRIORITY actions:

- Obtain funding for and model possible increased sedimentation caused by: i) a longer breakwater option; ii) runoff from climate-driven intense rain-storms at the inner harbor. [City]
- Obtain funding for and implement one of the three options for improving the breakwater. [City]

LONG-TERM actions:

- Update the ordinance governing mooring implementation to allow for sea-level rise and storm surge in the mooring field. [City]
- Conduct a comprehensive study resulting in a plan to implement the following:
 - A means, such as a levee, to provide protection from flooding due to sea-level rise on the harbor's west side, per risk horizon decided.
 - A means, such as a floating wave attenuation system, to minimize the worst impacts of storm-driven waves on the harbor.
 - A long-term plan for managed retreat and restrictions on further development for threatened harbor properties. [City]
- Complete and implement a management plan to protect the environmental integrity of the upriver estuarine portion of the harbor. [City]

Emergency Services and Facilities

Communications Systems



Current public communication systems are the wired telephone system and Wi-fi cellular systems. Emergency and marine services also include VHF radio links. In Belfast, only about 8% of households lack connectivity with the Internet. Still, in an emergency any type of contact may be vulnerable to widespread power loss, and the 'silencing' of communications. Authority over communications in emergencies is complicated by the separate jurisdictions of the City and the Waldo County Emergency Management Authority (WCEMA): such complications should be worked out jointly and warning systems tested regularly.

Recommended City Policy: Working with WCEMA, establish protocols for clear warning systems that can be accessed by all in the Belfast community during emergencies.

IMMEDIATE PRIORITY actions:

- Decide on the scope of warnings to be considered emergencies, e.g. air and water quality alerts, heat and cold emergencies, fire, flooding, etc. **[CCCS+]**
- Publicize the existence of clear warning systems agreed upon by the City and WCEMA so that the community learns how to access them. **[CCCS+]**
- Ensure that cell towers and cable repeater amplifiers have independent power backup systems for extended power outages. **[CCCS+]**
- Verify resilience of traffic light systems on roads in the event of power outages. **[City]**

LONG-TERM actions:

- Establish and promote a voluntary emergency backup Wi-Fi mesh city-wide intranet that utilizes private and public Wi-Fi servers. Participants would need an installed software application for initiation, control, and security. Those participants who do not have a back-up power supply could be provided with one. **[CCCS+]** **[Community]****[Ind]**

Public Shelters

If you were to get one of FEMA's severe weather warnings on your smart phone, and respond to it by clicking "Find nearest Emergency Shelter", FEMA would tell you that the nearest location within 200 miles is a community health clinic in Woonsocket, RI, 209 miles away. That would get your attention! Indeed, Belfast and Waldo County lack shelters where the public can go for relief during spells of severe heat or cold. The City has tried to provide temporary shelter in a few such spells, but these attempts aren't likely to scale at the rate that climate change is increasing the intensity and frequency of weather emergencies. In Belfast, 35.6% of the population is over 65, about twice the national average, and the elderly are most vulnerable to weather emergencies. Many people under 65, for a variety of reasons, including homelessness, also require emergency relief. *(See also section on "Public Health")*

Recommended City Policy: Working with WCEMA, establish one or more emergency shelter/s available to the community that are properly supplied and staffed for short-term, long-term as necessary, with locations well-publicized, and some transportation assistance provided.

IMMEDIATE PRIORITY actions:

- Begin organizing plan for emergency shelter operations: identify locations, public or private; sources for materials; and, as necessary, methods to provide meals, sleeping quarters, and sanitary facilities. [City] [CCCS+]
- Educate the community regarding the location of emergency shelter/s, instructions on using services. [CCC+]
- Promote adoption of efficient air-conditioning/heat pump installations in private and public buildings so that the community has less need for an emergency shelter. *(See also section on "Buildings and Homes")* [CCC+]

LONG-TERM actions:

- Working with the WCEMA, stockpile emergency food and water sufficient for a percentage of the population at need in an emergency, estimated for a portion of Waldo County as well as Belfast. *(See also section on "Food Security")* [City] [CCCS+]
- Investigate developing a new Community Center in Belfast to replace the Community Boathouse. This building should be large enough to function not only as a central emergency shelter, but also to serve a wide range of other community uses. [City] [CCCS+]
(CCC recommends this action knowing that the Community Boathouse's vulnerability to sea-level rise is already making it unsustainable, and that neither its size nor design allows sufficient flexibility for multi-purpose use.)

Food Security

Climate change is causing food to become more scarce and more expensive, all over the world. This is certainly a national problem: in Maine it hits hard because Maine has an aged population, and is considered the fifth most food insecure state in the nation, while Waldo County is the second most food insecure county in the state. Belfast is somewhat distant from major highways and airports, and if the transportation network were to fail the result would be a food distribution crisis. This could occur if storms or other disasters cause damage to the transportation system: climate change makes these disasters more likely. Maine is also at the end of some of the national distribution systems, and Belfast may be particularly vulnerable.

Recommended City Policy:

Working with WCEMA and other concerned parties, determine vulnerability of food distribution system locally, and develop a plan to deal with it.

IMMEDIATE PRIORITY actions:

- With the help of the Maine Department of Agriculture, Conservation and Forestry, parties along the Maine side of the food supply and distribution chains, as well as small regional and local food networks, develop data on food needs and sources specific to Belfast and its immediate neighbors in Waldo County. (See also section on “Natural Resources”/“Land”) [CCCS+]

LONG-TERM actions:

- Encourage entrepreneurship at all links of the grower-to-consumer food chain county-wide: collaborative distribution, gleaning projects, community fridges, food-processing and marketing cooperatives, affordable food centers, diversified farmers markets, and any other new approaches to maximizing uses of food produced locally. [CCCS+][Community][Ind]

TRANSPORTATION

Belfast, like all municipalities in the US, has evolved to support auto or truck transport, to the detriment of alternatives such as walking and bicycling. The City also lacks mass transit options. Quasi-public transport options include WCAP's Mid-Coast Transportation, which is affordable, flexible, and primed to expand, but needs ridership to do that. Biking, particularly on electric bikes, is growing in popularity during six months of the year. Although bike access from the outlying areas is complicated by Rts 1/3, bike lanes are marked within the Bypass to facilitate biking on major streets. Still, vehicles fueled by gas or diesel dominate the roads, making the transportation sector the greatest source of carbon emissions for Belfast—49%. With federal and state incentives, the community is gradually adopting electric vehicles, mostly charged at home; the City is providing charging stations for the traveling public partly offset by City solar power; WCAP plans to replace their fleet gradually with EV vehicles. All this is progress. For environmental, equity, and health reasons, however, the single solution of electrifying vehicles alone is neither desirable nor sustainable.

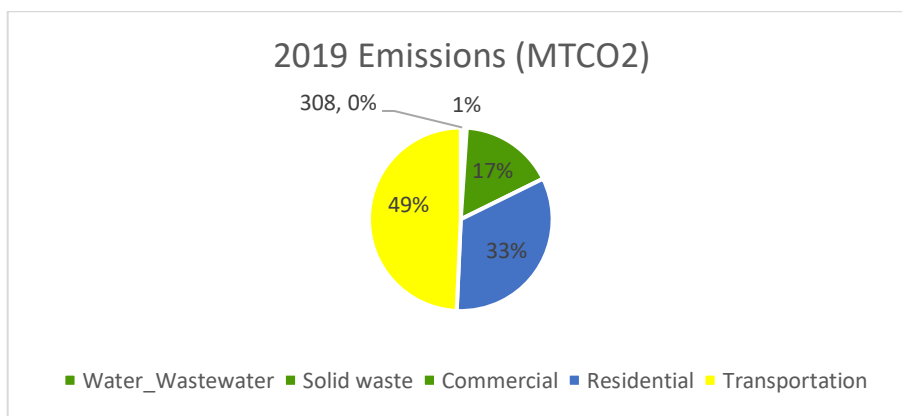
Recommended City Policy: Support a broad diversity of options to maximize public transportation for commuting and shopping, minimize need for car ownership, and make Belfast a safer, more walkable and bikeable community.

IMMEDIATE PRIORITY action:

- Monitor the use of Belfast's available electric charging stations and adjust per demand. [City]
- Assist WCAP in negotiating with the State on a possible State/City transit pass program for low-income users of WCAP. [City]

LONG-TERM actions:

- Lead by example: convert City fleet to electric or alternate non-fossil fuels when feasible. [City]
- Investigate possible locations and designs to take pedestrians and cyclists over or under major route crossings at locations where traffic signals are not permissible. [City][CCCS+]
- Expand bike lanes onto new routes where feasible at time of repaving. [City] [CCCS+]
- Encourage relevant businesses to consider a group purchase for electric bikes, reducing cost. [CCCS+]
- Publicize the availability of electric lawn mowers and other electric yard maintenance tools. [CCCS+][Community]
- Support and help publicize WCAP expansion to low fee/no fee public bus transport for intra-city, flex, and commuter routes as ridership increases. [CCCS+][Community][Ind]



BUILDINGS: HOMES AND BUSINESSES

In a survey of public opinion taken by ABCD that asked “What do you think are the most urgent issues to address in the Belfast Climate Action Plan?” the top three choices were tied, and Housing upgrades was one. The systems that Belfast citizens rely on to heat our homes, prepare our food, and provide hot water are major contributors to greenhouse gas emissions. 60.4% of Maine households rely on oil. Cooling our homes is already becoming an issue. The same considerations apply to commercial and City buildings. The CCC’s Greenhouse Gas Inventory (GHGI) shows that the combined sectors of residential and commercial energy use contribute 50% of Belfast’s emissions. A transition away from fossil fuels will require time to implement, however, while reducing energy use via energy efficiency in existing and new buildings is essential right away. In all cases of the policy and actions recommended below, the future cost of energy will be a powerful market incentive.

Recommended City Policy: To reduce carbon emissions and energy costs, continue transition to electricity or other green energy sources for heating and cooling and update energy efficiency throughout Belfast’s built environment.

IMMEDIATE PRIORITY actions:

- Adhere to Maine’s Uniform Building Code, at a minimum, which sets robust requirements for insulation in new construction. [City]
- For new construction, adopt changes to building codes that emphasize energy efficiency, especially in the case of affordable housing. [City]
- Publicize and promote adoption of efficient heat pump/cooling installations in private and public buildings. [CCCS+]
- Sponsor public tours of new homes and offices in Belfast that use sustainable building design and materials, advanced weatherization techniques, and energy-efficient appliances. [CCCS+]

LONG-TERM actions:

- Lead by example: continue doing regular energy audits, weatherizing City buildings and facilities and upgrading heating plants. [City]
- Develop an incentive program to assist homeowners and rental property owners upgrade existing housing stock. [City][CCCS+]

ELECTRIC POWER SYSTEM

Here in Belfast, solar and heat pump companies are busy installing products that will reduce our reliance on carbon-producing fuels and get us to an “electric economy.” The industry is in a growth phase in Maine. The number of heat pumps and solar panels installed in the City alone has not been tracked, but across the state 82,326 heat pumps have been installed since 2019 and the goal is for 100,000 by 2025, which is likely to be exceeded: this gives a sense of the rate. If the rate of increase for Electric Vehicles, EVs, meets the state targets as well (currently it does not), heat-pump systems and vehicle charging will likely double the power consumption of the typical Belfast home. The same trend will be true for City and commercial buildings. On the consumption side, growth of demand for electric power nationwide is expected to reach two to three times the present, not including allowance for population growth. On the generation side, renewable sources such as solar and wind will be available, but the capacity of the regional grid currently is too limited to take advantage of them: long interconnection delays are already happening in certain parts of Maine. The Maine Public Utility Commission (PUC) is currently beginning a planning process expected to update the distribution system in stages to increase capacity and incorporate more storage, perhaps through microgrids, to make effective use of renewables.

Recommended City Policy: Be proactive in understanding how the PUC planning process will affect the distribution system in Belfast so the City can benefit from increased capacity. [City]

IMMEDIATE PRIORITY actions:

- With CMP or other experts, develop a detailed model of the present electrical demand in Belfast as a critical tool for planning. [City]

LONG-TERM actions:

- Prepare for change in the electric power system by looking into zoning, regulatory, and code changes that encourage renewable power installations. [City] [CCCS+]
- Take every opportunity to establish a Belfast microgrid, allowing the interconnection of public and private renewable sources, combined with a substantial grid-level storage capacity for sustained operation independent of the grid when necessary. This would reduce the need for private homes with their own solar power to install battery systems. [City] [CCCS+]
- Encourage bi-directional EV charger installations, permitting the use of EV batteries to support the microgrid in emergency conditions. [City] [CCCS+]

NATURAL RESOURCES

Land, Soils and Farms

Belfast is comprised of 24,536 acres of land, with almost 40% of the land considered either prime farmland or soils of statewide importance. It has seven preserves or conservation areas consisting of more than 200 acres within city limits, as well as 13 municipal parks. Three parks and fifteen rangeways provide public access to the bay.

The greatest threats facing the health of land, foliage and crops are flooding due to increased levels of precipitation and extended periods of drought. The highest recorded levels of precipitation have occurred within the past decade. The classic definition of an “extreme precipitation event” is two or more inches of rain in 24 hours: this now occurs regularly. Flooding and erosion threaten soils, wildlife habitats and food production.

Local soils range from coastal sand and rock, to loam and prime agricultural soils, to compact glacial till, to wetland or hydric soils. The soil map above shows that most of Belfast’s land is not prime farmland; still, Belfast does have areas of prime and important soils that should be noted and treated with care. In urbanized areas, drainage has been subjected to years of engineering: cut-and-fill, streets, drains, culverts, and then springs, only some of which are natural. To make the land and soils more resilient, we need to protect the good soils, use natural regenerative processes to improve the ones that have been depleted, and use a variety of natural and engineered tools to address the soils most at risk. (See also section on “Stormwater”)

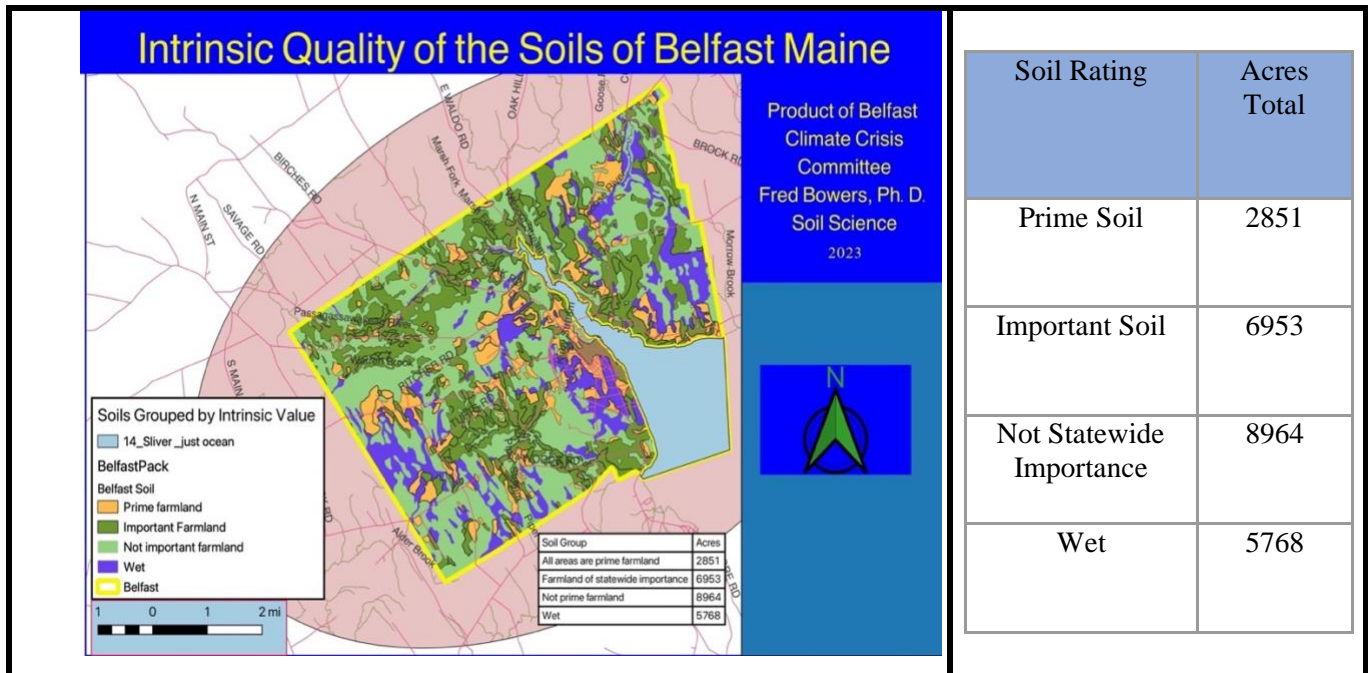


Figure 2 Intrinsic Value of Soils of Belfast

Map created by Fred Bowers

Recommended City Policies:

- Investigate the feasibility of adopting the federal and state land conservation goal of 30% by 2030 (aka “30x30”) for Belfast.

IMMEDIATE PRIORITY actions:

- Investigate a method of monitoring state information and mapping on PFAS and other toxic chemicals and their distribution in Belfast soils. These data will be useful for land development, gardeners, and farmers. In some cases, these data will be useful to protect areas like playgrounds.

LONG-TERM actions:

- Collaborate with organizations such as the Coastal Mountain Land Trust to preserve land and develop recreational opportunities. [CCCS+]
- Encourage citizen development of Certified Conservation Landscapes, including residential and small mixed-use properties, woodlands, farmlands and parks. [CCCS+] [Community][Ind]
- Use zoning tools to require siting of solar developments on PFAS-damaged land, previously developed land or other degraded sites rather than on prime farmland, soils of statewide importance or forested land. [City]
- Adopt education, tax, zoning, and other policies that encourage local farming and food production. [City]
- Advocate for farmland preservation. [CCCS+]



Shoreline

Belfast’s location at the mouth of the Passy estuary on Belfast Bay and Penobscot Bay includes approximately 240 parcels of land with frontage. The shoreline is under increasing stress from sea-level rise and storm surge. Predictions hold that Belfast can expect at least a foot of sea-level rise by 2050, and almost two feet by 2100, under reasonable scenarios of future GHG emissions. The intensity, frequency and duration of severe storms have caused extensive damage and threaten to overwhelm existing structures. Beach erosion and damage to marshes, seagrass beds, coastal bluffs and other natural features threaten habitats for wildlife. *(See also section on “Marine Facilities and Access”)*

The impact of climate change on Belfast’s shoreline has been a high priority for the City, and CCC’s first assignment was to prepare a report on sea-level rise, completed in 2019. Coincident with that, the CCC began collaborating with BAHS students, teachers and others to install equipment for a weather station and tide gauges at City Landing. CCC undertook this effort to develop data on sea-level rise, storm surge and wave action specific to Belfast, and believes that sharing this data with state experts will lead to more accurate predictions for the future. *(See also section on “Next Generation”)* In July, 2022 CCC held a meeting for all shoreland property owners of record and the public to present information about the coming impact of climate change on Belfast’s shores. This remains a top concern for the City, as this CAP shows. The community’s interests are not all aligned.

Recommended City Policy: Replace the breakwater to protect City Landing; next, if retreat is not acceptable in the mid to long term, a comprehensive plan to protect all of Belfast Harbor from sea-level rise, storm-driven waves and surge is essential. Priority should be given to the west side, where substantial public and private investment in infrastructure is most at risk. *[Same as in section on Marine Facilities and Access]*

IMMEDIATE PRIORITY actions:

- Develop a guidance document describing the procedure for obtaining permits to strengthen coastlines using seawalls or other forms of armoring, raising foundations, and implementing nature-based solutions. [City]
- Install Obscape tide, weather and time-lapse video sensors at City pier. [CCCS+]

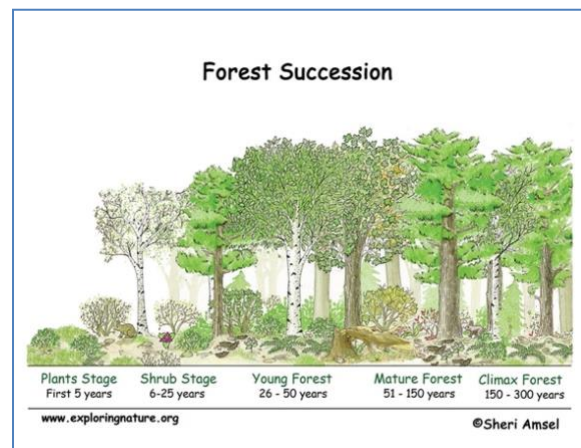
LONG-TERM actions:

- Continue to publicize information on sea-level rise and storm surge. [CCCS+]
- Publicize need for broader adoption of flood insurance. [CCCS+]
- Publicize information on the advantages and disadvantages of the various shoreline protection strategies to help citizens make choices. [CCCS+]
- Encourage collaboration by community groups to develop joint mitigation projects. [CCCS+]



Forests

Belfast has a long history of human occupation. Indigenous people occupied this area by around 10,000 years ago, and modified the forest somewhat before the Europeans arrived. Europeans cut down most of the original forest, harvesting large stands of white pine, oak, and maple. What we see now of the original forest is scattered in tiny fragments. Old landscape photos show the surrounding hills completely cleared for agriculture and homesites. Currently, the trees in Belfast comprise a “successional forest” that is frequently disturbed, sometimes harvested, and never likely to become a



mature “climax” forest. Furthermore, climate change is causing changes to the forest in terms of habitat for unfamiliar insect pests, invasive shrubs and plants. Migratory bird routes have shifted; animals are ranging into new territories. The Belfast community is on a steep learning curve to keep our forested areas healthy and biodiverse.

One strong motivation for encouraging forests is that healthy forests are particularly good at long-term capture (sequestering) of carbon and keeping it out of the atmosphere. The USDA Forest Service provides a calculator tool called “iTree” that calculates tree canopy and benefits derived from forests. Belfast’s benefits are calculated to be 526,732 US tons of carbon sequestered. The Belfast Parks Department, CCC, the Waldo County Soil and Water Conservation District, and environmental groups here are working hard to capture that value.

Recommended City Policy: Manage forested public land within Belfast for habitat, sequestration, and resilience values.

IMMEDIATE PRIORITY actions:

- Adopt the federal and state land conservation goal of 30% by 2030 (aka “30x30”) as the City’s goal and incorporate into the Comprehensive Plan. [City]

LONG-TERM actions:

- Lead by example: Collaborate with relevant local organizations to inventory, monitor, and improve the resilience of forested public land in Belfast. [City]
- Advocate with private property owners in Belfast to plant, monitor, maintain and improve the resilience of the trees on their property. [CCCS+][Community][Ind]

PUBLIC HEALTH

Medical Services and Facilities



Belfast is fortunate to have a well-staffed and equipped facility in the Waldo County General Hospital (WCGH), part of the Maine Health system, which provides a full range of medical services. WCGH implemented actions that were appropriate to protect the City’s citizens and visitors during COVID. Nonetheless, the pandemic illuminated some of the demands we can expect will be placed on our public health systems in the future.

Climate change will increase the rate of new health threats, as unfamiliar disease vectors develop locally in new weather conditions and spread, e.g. ticks carrying viruses not seen so far in Maine. Large-scale displacements of human and animal populations due to climate change may carry or exacerbate future pandemics here. Since a substantial part of our community is elderly, disabled, economically challenged, or uninsured, these possibilities are significant. *(See also section on “Emergency Facilities”)* Currently, the City has a collaboration with WCGH/Maine Health to support a public health nurse dedicated to meet the needs of medically disadvantaged community members. Her hands are capable, but full.

Recommended City Policy: Belfast should strengthen its capacity to convey local information to the community on climate-related disease, air and water quality alerts, heat and cold emergencies.

IMMEDIATE PRIORITY actions:

- Investigate or initiate expanded collaboration with WCGH, local and County EMA, the Midcoast Public Health Council/Maine CDC, and others, to react to alerts and other health information in order to inform and educate the public on climate-related disease, air or water quality, heat or cold conditions endangering public health. [CCS+]

LONG-TERM actions:

- If such action is taken, evaluate effectiveness for the Belfast community. [CCCS+]

COMMUNITY OUTREACH

Community outreach has always been a part of CCC's mission. The first period of outreach, from Fall, 2019 to Summer, 2021, could be considered Education. CCC began by taking its three-part report on sea-level rise to the community in monthly library programs. We showed this one immediate, tangible, and practical form of climate change to stimulate general awareness of the larger climate-change problem; we went on to invite a larger range of speakers to give monthly talks at the Library on different aspects of climate change. In early 2020, of course, education paused, but resumed eventually in sessions on Zoom.

The second period of outreach coincided with a program at the Belfast Free Library under a grant from the Institute of Museum and Library Services. The program was called "All of Belfast: Climate Dialogues" (ABCD). At first on a parallel track with CCC's educational effort, ABCD soon became a full-fledged partner with CCC in community engagement. On January 22, 2022 ABCD and CCC co-hosted a climate change (virtual) Symposium. Invitations were sent out to Belfast volunteer organizations, including some elsewhere in Waldo County, that work on climate-related matters. About 15 accepted, and shared brief descriptions of their activities, along with ideas about how they might collaborate going forward. The proceedings were captured in detail on the ABCD website, where all of ABCD's events, surveys, and other material have been archived. ABCD subsequently initiated a series of talks at the Library, first on Zoom, later back in person, on specific topics related to climate change, such as the ones covered in this CAP. The public was invited not only to hear from speakers but also to put forward their own ideas for action. This collaboration has resulted in a couple of large community meetings such as one on Shoreline Protection held in person (July, 2022), and one on the community's priorities for dealing with climate change, held earlier this year.

Recommended City Policy: Drawing upon the broad pool of expertise available locally, engage the community in deciding on further ways to implement the various policies this CAP recommends.

IMMEDIATE PRIORITY actions:

- Determine the additional informational resources needed for the Belfast community, in groups or as individuals, to implement the actions this CAP recommends, and make those resources available. [\[City\]\[CCCS+\]](#)

LONG-TERM actions: [Not applicable]

THE NEXT GENERATION

CCC considers the Next Generation of citizens to be crucial part of the community conversation on what to do about climate change, and has involved them in two different ways.

1. First, Belfast Area High School (BAHS) students have done hands-on work to support data-gathering at the harbor and other points around the Belfast shoreline.

- a) Helped install six coastal flooding observation posts to capture photographic evidence of flood levels, in collaboration with National Weather Service/NOAA. (2019)
- b) Installed a weather station on City pier. Broadcasting on Weather Underground at KMEBELFA20 (2019-2020)
- c) Installed a tide gauge at the harbor with a radar unit to measure tide levels. (2019)
- d) Designed, built and installed a companion ultrasonic sensor tide gauge at the same location on the pier. (2020)
- e) Installed a much larger and stable mast for the weather station and gauges mentioned above, plus other equipment to run all on solar power. (2023)

2. Second, BAHS students have participated as full members of CCC. In 2021, CCC asked the Council for a student membership “slot” on CCC. In order to ensure meaningful participation, CCC requested that student members would not be a) required to be 18+, or b) registered to vote, as adult members are, and that they could have c) full voting power on the CCC, the same as adult members do. At a regular meeting (January 5, 2021), the Council approved the three stipulations, and also agreed that d) the power of appointment for students could come from BAHS faculty, not the Council itself. After these approvals CCC had one active student member for about 1 ½ years until June 2022, when he graduated. One of his achievements was to re-activate a Climate Action Club at BAHS that planned several projects. During the following summer, three more students indicated interest in possibly joining CCC, and did maintain the Climate Action Club, but due to scheduling problems none of the three was able to join.

CCC had hoped those same three students could contribute to this CAP, but the timing turned out to be wrong. CCC believes strongly that part of the reason the Next Generation hasn't always been part of the conversation is that adults, with the best of intentions, have taken on the role of speaking for them. This CAP will not do that.

Recommended City Policy: Determine to incorporate students into the conversation about climate-change policies and priorities, preferably via membership on the CCC, but, if necessary, in some other way; and enlist them as much as possible in climate-change actions.

IMMEDIATE PRIORITY actions:

- Continue student membership on CCC per the four stipulations approved by the City Council.

LONG-TERM actions: [TBD by students and faculty]

APPENDICES

TABLE OF RECOMMENDED IMMEDIATE PRIORITY ACTIONS

CRITICAL INFRASTRUCTURE	
Wastewater Treatment/Sewer System	<ul style="list-style-type: none"> • Harden the WWTP site to prevent flooding, per the “2022 Climate Adaptation Plan.”
Stormwater System	<ul style="list-style-type: none"> • Complete the combined stormwater and sewage routing (CSO) elimination program in accordance with City Engineers’ advice. • Following the current survey and mapping phase, determine the need to increase the capacity of the existing and future system—drainpipes and culverts—to accommodate projected increased peak storm rainfall intensity and duration.
Roads	<ul style="list-style-type: none"> • Digitally map those areas where low elevation and ponding make flooding along certain roads likely. GIS 2-foot Lidar coverages are available from the State of Maine GIS database that help with advance planning to protect roads against weather-related damage, to repair roads that have already sustained damage, and at a minimum, to alert the Public Works Department or the police where to post warning signs for the driving public.
Marine Facilities and Access	<ul style="list-style-type: none"> • Obtain funding for and model possible increased sedimentation caused by: i) a longer breakwater option; ii) runoff from climate-driven intense rain-storms at the inner harbor. • Obtain funding for and implement one of the three options for improving the breakwater.
Emergency Services and Facilities	
Communication Systems	<ul style="list-style-type: none"> • Decide on the scope of warnings to be considered emergencies, e.g. air and water quality alerts, heat and cold emergencies, fire, flooding, etc. • Publicize the existence of clear warning systems agreed upon by the City and WCEMA so that the community learns how to access them. • Ensure that cell towers and cable repeater amplifiers have independent power backup systems for extended power outages. • Verify resilience of traffic light systems on roads in the event of power outages.

<p>Public Shelters</p>	<ul style="list-style-type: none"> • Begin organizing plan for emergency shelter operations: identify locations, public or private; sources for materials; and, as necessary, methods to provide meals, sleeping quarters, and sanitary facilities. • Educate the community regarding the location of emergency shelter/s, instructions on using services. • Promote adoption of efficient air-conditioning/heat pump installations in private and public buildings so that the community has less need for an emergency shelter. (See also section on “Buildings and Homes”)
<p>Food Security</p>	<ul style="list-style-type: none"> • With the help of the Maine Department of Agriculture, Conservation and Forestry, parties along the Maine side of the food supply and distribution chains, as well as small regional and local food networks, develop data on food needs and sources specific to Belfast and its immediate neighbors in Waldo County. (See also section on “ Natural Resources”/”Land”)
<p>TRANSPORTATION</p>	<ul style="list-style-type: none"> • Monitor the use of Belfast’s available electric charging stations and adjust per demand. • Assist WCAP in negotiating with the State on a possible State/City transit pass program for low-income users of WCAP.
<p>BUILDINGS and HOMES</p>	<ul style="list-style-type: none"> • Adhere to Maine’s Uniform Building Code, at a minimum, which sets robust requirements for insulation in new construction. • For new construction, adopt changes to building codes that emphasize energy efficiency, especially in the case of affordable housing. • Publicize and promote adoption of efficient heat pump/cooling installations in private and public buildings. • Sponsor public tours of new homes and offices in Belfast that use sustainable building design and materials, advanced weatherization techniques, and energy-efficient appliances.
<p>ELECTRIC POWER</p>	<ul style="list-style-type: none"> • With CMP or other experts, develop a detailed model of the present electrical demand in Belfast as a critical tool for planning.

NATURAL RESOURCES	
Land, Soils and Farms	<ul style="list-style-type: none"> Investigate a method of monitoring state information and mapping on PFAS and other toxic chemicals and their distribution in Belfast soils. These data will be useful for land development, gardeners, and farmers. In some cases, these data will be useful to protect areas like playgrounds.
Shoreline	<ul style="list-style-type: none"> Develop a guidance document describing the procedure for obtaining permits to strengthen coastlines using seawalls or other forms of armoring, raising foundations, and implementing nature-based solutions. Install Obscape tide, weather and time-lapse video sensors at City pier.
Forests	<ul style="list-style-type: none"> Adopt the federal and state land conservation goal of 30% by 2030 (aka “30x30”) as the City’s goal and incorporate into the Comprehensive Plan.
PUBLIC HEALTH	
PUBLIC HEALTH	<ul style="list-style-type: none"> Investigate or initiate expanded collaboration with WCGH, local and County EMA, the Midcoast Public Health Council/Maine CDC, and others, to react to alerts and other health information in order to inform and educate the public on climate-related disease, air or water quality, heat or cold conditions endangering public health.
COMMUNITY OUTREACH	
COMMUNITY OUTREACH	<ul style="list-style-type: none"> Determine the additional informational resources needed for the Belfast community, in groups or as individuals, to implement the actions this CAP recommends, and make those resources available.
NEXT GENERATION	
NEXT GENERATION	<ul style="list-style-type: none"> Continue student membership on CCC per the four stipulations approved by the City Council.

SAMPLING OF FUNDING SOURCES

The effects of climate change are both massive and varied and will continue to accelerate. Addressing the many elements outlined in the Climate Action Plan will unquestionably result in truly significant expenditures. There are, however, three unalterable facts:

1. the costs of **in**action to Belfast will be significantly greater than action, both in dollars and quality of life;
2. the price tag for adaptation and mitigation projects will undoubtedly increase with each passing year;
3. taking comprehensive and well-designed action **now** will help to secure the health, well-being and safety of Belfast's residents, structures and natural resources.

The imperative to act is clear and urgent.

(Note: For eligibility and specific terms check the website of the boldfaced funding entity)

Community Resilience Partnership

Membership allows municipalities to write grant proposals for specific projects funded by state agencies and federal money from the Inflation Reduction Act.

INFRASTRUCTURE

FEMA

Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act

Hazard Mitigation Grant Program (HMGP)

Flood Mitigation Assistance Program

Building Resilient Infrastructure and Communities Program

Legislative Pre-Disaster Mitigation (LPDM)

US Dept. of Housing and Urban Development (HUD)

Community Development Block Grants

Economic Development Administration (EDA)

Public Works and Economic Adjustment Assistance Act

Department of Marine Resources

Shore and Harbor Planning Grant

U.S. Department of Agriculture

Community Facilities Direct Loan Program

National Wildlife Federation

National Culvert Removal, Replacement and Restoration Grants

National Coastal Resilience Fund (NCRF)

Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant Program

Watershed and Flood Prevention Operations

Water Infrastructure Finance and Innovation Act
Building Resilient Infrastructure and Communities (BRIC) Program
Sewer Overflow and Stormwater Reuse Municipal Grants
Flood Mitigation Assistance Grant

MARINE FACILITIES

Department of Marine Resources
Shore and Harbor Planning Grant

Maine AmeriCorps Planning Grants
Environmental resilience, adaptation and sustainability

Island Institute
ShoreUp Grants

ELECTRIC POWER SYSTEM

U.S. Department of Energy
Office of Clean Energy Demonstrations
Office of Energy Efficiency and Renewable
Energy Improvements in Rural or Remote Areas Program (ERA)
C2C: Clean Energy to Communities

U.S. Department of Agriculture
Rural Energy for America Program: Renewable Energy Systems and Energy Efficiency
Improvement (REAP)

TRANSPORTATION

US Department of Transportation
Thriving Communities Program
PROTECT Formula Program

Efficiency Maine Trust
Public DC Fast Charging stations

BUILDINGS: HOMES and BUSINESSES

Maine AmeriCorps Planning Grants
Housing, home energy conservation, weatherization

Efficiency Maine Trust
Low- and Moderate-Income Weatherization Initiative
Collective Purchase Agreements

Island Institute
Spark! Clean Energy Grants

U.S. Department of Energy

High Efficiency Electric Home Rebate Act (HEEHRA)

NATURAL RESOURCES

National Fish & Wildlife Foundation

National Coastal Resilience Fund.

North American Wetlands Conservation Small Grant

North American Wetlands Conservation Standard Grant

National Urban and Community Forestry Challenge

National Estuary Program

Coastal Watersheds Grant Program

Department of Agriculture, Conservation and Forestry

Coastal Community Planning Grant

Department of Marine Resources

Shore and Harbor Planning Grant

U.S. Department of Agriculture

Community Facilities Direct Loan Program

U.S. Forest Service

Urban and Community Forestry Grants

National Oceanic and Atmospheric Association (NOAA)

The Coastal Zone Management Act (CZMA)

Community-Based Restoration Program

National Coastal Resilience Fund (NCRF)

National Wildlife Federation

Land and Water Conservation Fund

National Coastal Resilience Fund (NCRF)

Wetland Reserve Easement Program

Flood Mitigation Assistance Grant

Watershed and Flood Prevention Operations

SMCC Land Trust Grant Fund Program

Maine Community Foundation

Conservation For All

Maine Land Protection

Island Institute
ShoreUp Grants

PUBLIC HEALTH

U.S. Department of Agriculture
Community Facilities Direct Loan Program

Maine AmeriCorps Planning Grant
Public Health, emergency preparedness

Onion Foundation
Equitable Outdoor Access Grant

Elmina B. Sewall Foundation
Healthy People, Healthy Places Grant

NOTES AND SOURCES

(A) INTRODUCTORY NOTE ON BACKGROUND READING

1. The “ancestor” of any report on climate change all over the world are the UN Sustainable Development Goals (SDGs), which provide the backdrop for the Paris Agreement, the IPCC reports, the US national reports on climate change, etc., and etc., on down to Belfast’s pledge to the Global Covenant of Mayors, the context in which this Belfast CAP is written. The UN SDGs can be found at <http://www.un.org/sustainabledevelopment>.

2. The “parent” of this Belfast CAP is the Maine CAP, entitled Maine Won’t Wait. Issued in December 1, 2020, it can be found at https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf

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(B) NOTES AND SOURCES FOR THE SECTIONS

INTRODUCTION

“Maine Won’t Wait” is at https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf

CRITICAL INFRASTRUCTURE

1. The ABCD survey noted is archived at the Belfast Free Library (<https://belfastlibrary.org>). See tab for ABCD, then “Surveys.”
2. Credit for photos of flooding at Harbormaster’s shack during the Christmas Storm, ‘22: Fred Bowers

[Wastewater Treatment/Sewer System]

1. The Olver “2022 Climate Adaptation Plan” referenced [98 pp. + 84 pp. maps] is archived in “City Manager’s Report and Exhibits” for a Council meeting in March ‘22, and can be obtained from the City Manager’s office in Belfast or from Olver Associates, Richmond, ME (207-737-4092). The pages most relevant for this CAP are Sections 3-6, pp. 36-76; and Section 7, pp. 77-78.
2. The map of the WWTP showing 14’ line and other markings was created by Fred Bowers using data from Olver ‘22 Plan above.

[Stormwater System]

The Olver “Stormwater Drainage System Review scope of work project” referenced is archived in “City Manager’s Report and Exhibits” for Council meeting on September 20, 2022. See <https://www.cityofbelfast.org/ArchiveCenter/ViewFile/Item/3969>. (The relevant pages of the Manager’s Report and Exhibits are Discussion item 10-I, pp. 10-11; and memo re 10-I, pp. 71-73.) Work on the project was begun by surveyors in ‘23.

[Roads] [Photo credit TBD]

[Marine Facilities and Access]

1. All the information here, including the maps, came from Jerry Brand, member of the Harbor Committee, and was verified by Harbor Committee.
2. The City of Belfast owns or controls multiple public access points to the water in addition to City Landing and Thomson’s Wharf, as shown on the map below. Rangeways are property owned by the City, and rights-of-way are controlled access points over privately-owned property.

Access Ways To Water

1. Allyn Street
2. Commercial Street
3. Condon Street
4. Delemos Street (*action pending*)
5. Fahy Street
6. Footbridge-east
7. Footbridge-west
8. Highview Terrace
9. Huntress Avenue/Street
10. Mayo Street
11. Mitchell Street (*action pending*)
12. Parish Strout Farm
13. Race Street
14. Stephenson Lane
15. Upper Bridge-east
16. Upper Bridge-west
17. Upper Mason Pond



3. Mooring fields in the inner and outer Harbor were configured in 2014 to meet ACOE requirements for the federally-dredged channel. An outer harbor restricted anchoring area was defined for large vessels. All these areas are managed by the Harbormaster.

4. The three design options given for the breakwater were: a) replacement of the breakwater and crib in their original footprint with materials giving a longer service life, and increasing the height by 4'; b) demolishing the crib and increasing the length by 60'; c) demolishing the crib and adding heavy dockage that would provide improved protection for the City Landing facilities.

[Emergency Facilities]

Communication—Any further information via Belfast Broadband Committee or WCEMA

Public Shelters—Any further information from Jerry Brand, joint CCC/Harbor Cte. member

Food Security—Information on food insecurity status of Maine and Waldo County came from an article by John Viehman, President, United Midcoast Charities, "Securing our safety net: Food insecurity" (*Republican Journal*, March 30, '23). Additional information came from the 3rd Maine Food Waste Solutions Summit, April 14, '23. The Summit agenda, recording, Q&A, and list of resources may be accessed through the Mitchell Center at UMaine: <https://umaine.edu/mitchellcenter/2023-maine-food-waste-solutions-summit/>.

TRANSPORTATION

1. The limited mass transit options that WCAP Mid-Coast Transportation would like to expand with ridership demand are: a) an intra-city Belfast Downtown Area Shuttle (DASH) that loops to certain popular destinations seven times a day for a low fee; and b) Inter-city Flex bus service on a once-daily basis to and from surrounding towns, with a one-way fare ranging from \$2.00 to \$3.50. For schedules or any further information go to <https://waldocap.org/public-transportation/> or call (855) 930 7900, Option 2. Hours are 7:00a-5:00p.

3. For the sources of more information on EVs, see notes below under "Electric Power."

4. For information on other ways to get around than mass transit or cars, Belfast's Pedestrian, Biking and Hiking committee has many ideas and plans. See their page on the Belfast City website.

BUILDINGS and HOMES

1. A geothermal heat pump system, and/or a system relying on ocean thermal exchange, could yield the highest operational efficiency throughout the year and could be used for some municipal buildings.

2. For a wealth of information on heat-pump and hot water systems, electric appliances of all sorts, weatherizing, and more, along with federal funds flowing through state channels out to municipalities and residents in rebates, go to Efficiency Maine, <https://www.energymaine.com/> or call 866-376-2463. Efficiency Maine's services are essential to implementing parts of this CAP.

ELECTRIC POWER

1. As for EVs—plug-in-hybrids and battery EVs together—the state total went up by about 2000 during 2021-2022, with 94 charging stations added. That was only a quarter of the way to the target, doubtless putting off the coming pinch on power.

2. An excellent source for gaining information about the targets and progress toward beneficial electrification in Maine is "Maine Won't Wait Progress Report, December 1, 2022." Available from the Governor's Office of Policy Innovation and the Future, maine.gov/future, it can be read as a pdf, but it also directs the user to rapidly updated websites where the data is always current, such as the "Maine Won't Wait" dashboard, maine.gov/climateplan/dashboard.

3. For Maine's Public Utility Commission, see <https://www.maine.gov/mpuc>

NATURAL RESOURCES

Land, Soils and Farms—The information here on the landscape scale is gathered from the City's Comprehensive Plan, and maps at the Planning and Codes Office. The information on soils and the map describing soils are original to this CAP, having been put together by Fred Bowers, CCC Chair, from deeper data sources with the aid of mapping tools not commonly available. This is a significant aid to any policy-maker, and to any people or groups implementing the CAP.

Shoreline— If global greenhouse gas warming isn't curbed, the most extreme scenarios for sea-level rise indicate that Belfast can expect up to three feet of sea-level rise by 2050, and up to nine feet by 2100. Clean-up and restoration from the recent Christmas Storm December 2022, which occurred under "beginning" sea-level rise, cost ~\$120,000; against that, the problem of more extreme sea-level rise becomes clear. More information about the costs of sea-level rise to Belfast can be found in the 3-part report issued by CCC 2018-19. (September, 2018: <https://www.cityofbelfast.org/DocumentCenter/View/2331/27-September-SLR--Part-1?bidId=>); (December, 2018: <https://www.cityofbelfast.org/DocumentCenter/View/3116/CCC-Report-2>); (April, 2019: <https://www.cityofbelfast.org/documentcenter/view/3117>).

For the Shoreland Property Owners' meeting held July 6, 2022 to present information about the coming impact of our changing climate on shoreline properties, all of the property owners of record on the shoreline in the Belfast City limits were invited by snail-mail as the primary audience, but the event was advertised and open to the general public. Attendance was high from both groups.

Forests—This sub-section was put together by Fred Bowers from his own background knowledge and various other sources. Credit for the illustration is given on the illustration. The iTree tool he used to settle on a figure for the tons of carbon sequestered by trees in Belfast yielded the table shown below.

Table 1. Forest Benefits to Belfast (2021 data)

Subject	Numerical Value
Tree canopy	60.44%
Forest Acres	13,166 acres
impervious surfaces	1,047 acres
Carbon Sequestered	10,651 tons
CO ₂ Equivalent ¹	39,055 tons
Runoff Avoided	9 MG/yr
Rainfall Intercepted	1,066 MG/yr
Carbon Monoxide	5,349, lb/yr
Ozone	599,347, lb./yr
Nitrogen Dioxide	97,423, lb./yr
Sulfur Dioxide	4,956, lb./yr
PM	25,190, lb./yr
Carbon Storage	526,583 tons
CO ₂ Equivalent ¹	1,930,805 tons

CO₂ = Carbon dioxide, PM_{2.5} = Particulate matter 2.5 microns or less, tn =Short ton (US), t = Tonne / metric ton, MG/yr = Millions of gallons per year, m³/yr = Cubic meters per year, lb/yr = Pounds per year, kg/yr = Kilograms per year